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METHODOLOGICAL ISSUES

METHODS AND TOOLS TO EVALUATE IMPACTS AND ADAPTATION

Information on impacts and adaptation assessment methods

Progress report

Note by the secretariat

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I. INTRODUCTION

A. Mandate

1. The Conference of the Parties, by its decision 9/CP.3, requested the secretariat 'to continue its work on the synthesis and dissemination of information on environmentally sound technologies and know-how conducive to mitigating, and adapting to, climate change; for example by accelerating the development of methodologies for adaptation technologies, in particular decision tools to evaluate alternative adaptation strategies'.

2. In response to the above request, an initial compendium of decision tools to evaluate strategies for adaptation to climate change was prepared by the secretariat and made available to the participants at the tenth session of the Subsidiary Body for Scientific and Technological Advice (SBSTA). The SBSTA invited Parties to submit additional information on decision tools and comments on the compendium. It requested the secretariat to facilitate the submission of the additional information electronically on its web site (FCCC/SBSTA/1999/6, para. 55 (b)).

3. At its eleventh session, the SBSTA repeated its invitation to Parties, international organizations and other organizations to submit additional information, particularly on new decision tools, models and methodologies to assess climate change impacts and adaptation, electronically via the web or by facsimile or mail, by 15 February 2000. It requested the secretariat to utilize experts from the UNFCCC roster of experts to review this information, as appropriate. The SBSTA also requested the secretariat to prepare a progress report on this subject for consideration at its twelfth session (FCCC/SBSTA/1999/14, para. 68).

B. Scope of the note

4. This note presents information in response to the above mandate. It summarizes the information on new methods and tools contained in submissions from Parties and organizations. The note also identifies issues regarding further work of the secretariat on impacts and adaptation methodologies. It does not provide a comprehensive analysis of the information submitted on new methods and tools. Parties may also wish to read the submissions from Parties contained in document FCCC/SBSTA/2000/MISC.5.

C. Possible action by the SBSTA

5. The SBSTA may wish to consider the information in this note and provide guidance to the secretariat on the future evolution of the work, particularly on matters related to a process for reviewing the new information using the UNFCCC roster of experts and further development of the database.

6. The SBSTA may also wish to consider whether the general issue of adaptation warrants a more comprehensive approach and, if so, how and when it might be considered by either or both of the subsidiary bodies.

II. BACKGROUND

7. In response to the mandate given at the tenth session of the SBSTA, the secretariat h developed a database and designed web pages to facilitate the transfer of information on me and tools to evaluate impacts and adaptation. The web site also allows interested Parties an organizations to submit the information on new tools, methods and models not included in initial database. An on-line form has been designed to enable the Parties and organizations submit the information in a common format so as to facilitate compilation and access.

8. The secretariat has informed the Intergovernmental Panel on Climate Change (IPCC the availability of the database to and solicited additional information from the lead authors participating in the Third Assessment Report (TAR) of Working Group II (WG II) via the Technical Support Unit of the IPCC WG II.

9. The IPCC is currently synthesizing information on the methodologies and tools to evaluate the impacts of and adaptation to climate change. The TAR, due in 2001, will inclu special chapter which will assess available methods for examining and projecting key aspec the environment, economy and society that are likely to influence current and future vulnerability. It expects, among other things, to provide the information about the adequacy current methodologies as tools for designing adaptation policies. The chapter will also incl information on the applications of decision analysis frameworks to adaptation decisions.

III. SUMMARY OF NEW INFORMATION

A. Coverage

10. The secretariat received 13 submissions, five of them electronically. The submissio were received from two Parties (China and the United States of America), eight non-governmental scientific organizations and one non-governmental environmental organization. Two submissions were made on behalf of two groups of experts: a group of t IPCC WG II lead authors, and a group of experts involved in the United Nations Environme Programme (UNEP) on vulnerability index development. A list of Parties and organization a summary of the information submitted are given in annex I. Submissions from Parties are reproduced in document FCCC/SBSTA/2000/MISC.5.

11. The submissions contained the following: information about new methods and tools evaluate impacts and adaptation; a general overview of tools for evaluating alternative adapt strategies; comments on usage of the methods and tools currently included in the database, a observations regarding possible evolution of the UNFCCC work in the area of synthesis and dissemination of the impacts and adaptation methodologies. Five submissions included supplementary information, such as publications and reports.

B. Information on new methods and tools to evaluate impacts and adaptation

Overview

12. Eight submissions contained information, structured according to the form provided by the secretariat, on 25 new methods and tools for six natural resource and socio-economic sectors. A list of the tools and methods and the scope of their application covered in each sector is provided in annex II.

13. Most of these methods and tools fall into two broad categories. Seventeen of them can be used to evaluate specific adaptation options and/or broad adaptation strategies. The second category contains eight methods that focus more heavily on the assessment of biophysical and socio-economic impacts of climate change in different sectors than on adaptation options and strategies.

14. Most methods and tools are applicable to more than one sector. Five methods and/or tools concerned the agricultural sector and two the water sector; three methods and/or tools support the assessment of impacts and adaptation of coastal zones. Three models address the assessment of impacts and adaptation options in the forestry sector and ecosystems, the sectors which have not been previously included in the database.

15. Seventeen methods and tools have been applied only in a specific region, country or site (for example, agriculture in Africa, the Chinese coast, Canadian farms, etc.). However, most of these methods are reported to be adaptable to other regions. Twenty of the submitted methods and tools do not require extensive technical knowledge of modelling or specific decision-making techniques for use. The use of the remaining models may require particular expertise and skills.

Methods and tools applicable to multiple sectors

16. Fifteen methods and tools which are applicable to multiple sectors, range from general qualitative tools for initial adaptation analysis to the behavioural models, and modelling tools for economic analysis and decision analysis frameworks. In addition, two regional models to predict future climate change are also considered as general tools, as being used in the initial stage of climate change impacts and vulnerability assessment in different sectors.

17. General tools for initial assessment include a number of qualitative methods, such as conceptual frameworks and checklists, for assessing potential adaptation strategies and their main dimensions. An adaptation strategy is defined here, apparent from a specific adaptation option, as broad constructions of learning and monitoring that build capacity to respond to climate change by proposing timely measures.

18. A number of methods of that kind, such as Conceptual Frameworks for Judging Adaptive Capacity, Assessment of Climatic Change and Variability, the Dimensions of Adaptation Model and Risk Management Framework, are used to provide the structure and hypotheses for

numerical impact and risk assessments in the context of the coping capacity of the human systems. The Stakeholder Networks and Institutions Analysis Framework is a qualitative me which is used to evaluate these dimensions of adaptation strategies in the context of changing risk of climate change and variability. The above methods could contribute to the existing database by explicitly including examination of adaptive capacity in the adaptation analysis. Although the methods are best applied during the planning stages of an adaptation study, they can be used in the evaluative stage as well.

19. The Vulnerability Indicators Programme (VIP) and the Agent-Based Social Simulatio models represent a more formal approach to assessing vulnerability and adaptive capacity. T VIP model quantitatively assesses the vulnerability of valued attributes of societies and economies and identifies target vulnerable regions. The second model is used to simulate the behaviour of stakeholder networks to enable the analyst to evaluate different pathways, constructed as the outcome of multiple decisions.

20. A tool for economic and integrated analysis is the Policy Analysis of the Greenhouse Effect model, which treats adaptation as a policy choice to be evaluated on the same basis as mitigation. This model calculates the costs and impacts of policy choices, and evaluates the uncertainty and both economic and non-economic impacts.

21. The Tolerable Windows Approach is a model for a decision-making framework. It applies the principles of the safe minimum standard approach to the climate change problem. Although the model has not yet been used for assessment of adaptation to climate change, it reported to be useful for assessing different climate change policy paths in this area, especially for providing guidance in situations where the applicability of cost-benefit analysis is limited

22. Two Regional Climate Models, the Regional Climate Model over China and the Clim Scenarios/Prediction System, are designed to predict climate change, including extreme even over a regional domain due to both natural and anthropogenic changes. The methods are reported to be useful tools both for assessing future vulnerability across different sectors and making strategy decisions in regard to adaptation to climate change.

Water resources methods

23. The water sector tools described in the submissions represent mathematical models f assessing water resource changes under various hydrological and climate conditions. These models are reported to be useful in evaluating water resource management strategies for adaptation to climate change, and in assessing time-varying changes in the frequency of floo and droughts and their socio-economic consequences across all sectors.

Coastal zones methods

24. Two coastal models aim to assist the user in evaluating the impacts of sea-level rise and storm surges under conditions of climate change along the coasts of China and Australia. Both models can be used to evaluate risks under a range of possible management adaptation options in the regions.

Agricultural methods

25. The agricultural sector tools listed in annex I range from a site-level crop model to the models for analysis of different adaptation options and their characteristics and consequences, both at farm- and at sector-wide levels. Included also is the Process Weather Transfer Tools for Crop: the Chinese Weather Generator, a model which produces input weather data for crop models.

26. The Risk Management Framework is a crop model, which is designed to assess the impacts of various management and natural condition scenarios on crop productivity. The tool is indicated to be helpful in exploring adaptation options and their cost at site level.

27. The Agricultural Adaptation to Climatic Variation and the Relative Risk Index methods represent qualitative tools which examine the driving forces, risks and responses to adaptation. The first model is designed to aid users in evaluating endogenous and exogenous factors that influence adaptation responses and classifies those responses into various farm tactical, and strategic adaptation decisions. The Relative Risk Index method illustrates the overall level of risk, before and after adaptation, a farmer faces in light of various cropping decisions and climatic variations. The method is intended to help in assessing various cropping practices.

28. The method entitled Government Support for Agriculture Losses due to Climatic Variability is a statistical tool designed to describe and evaluate over time the sustainability of government support programmes that are provided in response to climate variability and weather extremes. The methodology could be helpful in assessing different planned adaptation measures.

Natural ecosystems and forestry sector methods

29. Three models included in the natural ecosystems and forestry sections of annex II evaluate the potential impact of climate change on forest and vegetation, and assess different management options. The Climate Vegetation Response Model focuses on analysis of the biophysical impacts of higher carbon dioxide levels and climate change on vegetation of different ecosystems (forests, steppes, deserts, grasslands, etc.). The Process Forest Model: Geographical Information System for the Impact of Climate Change on Forest can be considered as an expert system for examining scenarios of forest development and management under different climate conditions. The models are used for initial vulnerability assessment and defining response adaptation options in the related sectors.

C. Specific issues related to methods and tools

30. The main goal of the work on impacts and adaptation methodologies, as identified mandate, is to promote the exchange of information on the methods and tools. It is anticip that this would assist Parties in applying the best available methods in their vulnerability a adaptation assessments. The activities undertaken by the secretariat have raised a number issues related to further developments towards achieving this goal. These issues are identi below.

31. Comments from a Party and a number of informal comments from organizations a experts suggest that the database developed by the secretariat is useful and that having suc information on the web is helpful. However, the secretariat has received information on s models from only one Party, and from a few other organizations. Until now, submitting information has been a voluntary activity often motivated by a desire of researchers to exc information. One reason for not submitting the information given by other organizations, research institutes, is that they do not have the resources to train individuals from other co who may be interested in using their method. The reason for Parties not submitting inform may be that they simply do not consider information on impact models a high priority. If t wish the secretariat to continue this activity, the following options could be considered to enhance the exchange of information on methods and their applicability:

(a) Amending part II of the guidelines for the preparation of national communi by Parties included in Annex I, to require Annex I Parties to report information according format on the web site;

(b) Encouraging the IPCC to cooperate with the secretariat to produce an exten compendium of methods, for example, those noted in the TAR; and

(c) Conducting a workshop to share experience in using different methods and identify what kind of new information is needed.

32. The comments received from experts and organizations suggest a need to improve quality of information on the methods, by evaluating the methods and by providing more examples of their application. This might make the information more useful to the Parties Parties may wish to consider whether this should be done, and if so, how such improveme should be made. The options that could be considered in this regard include conducting a expert meeting and/or utilizing the roster of experts to evaluate methods and provide more information on their applicability.

33. The exchange of information and the ability to apply impact and adaptation metho linked to the issue of capacity-building. The SBSTA may wish to consider what should be to improve the ability of Parties to use these methods as they draw up a draft framework fo capacity-building activities in accordance with decisions 10/CP.5 and 11/CP.5.

IV. GENERAL ISSUE OF ADAPTATION

34. Methodologies to assess impacts and adaptation options are only one aspect of the broad issue of adaptation. Information on other aspects has been considered by both the subsidiary bodies separately and on different occasions. For example, the secretariat has made available information on coastal zone adaptation technologies (FCCC/TP/1999/1) and the adverse effects of climate change under Article 4.8 (FCCC/SB/1999/2, FCCC/SB/2000/2).

35. Heretofore, most of the attention of the subsidiary bodies has been on issues related to reducing greenhouse gas emissions. Neither subsidiary body has had a broad discussion on adaptation, what aspects should be considered under the Convention or what approaches should be taken to address the issue. Yet, if climate change trends continue, the need for adaptation is likely to increase. The period following COP 6 may be an appropriate time to initiate a more comprehensive approach to this issue, taking into consideration the information likely to be provided in the Third Assessment Report of the IPCC, information in national communications and documents prepared by the secretariat.

Annex I

LIST OF PARTIES AND ORGANIZATIONS AND SUMMARY OF INFORMATION SUBMITTED

Source	Summary of submissions
Parties	
China	Ten models and methods to assess impacts and adaptati options for six sectors, including general tools.
United States of America	A review of decision-making and decision-support tools evaluating alternative adaptation strategies.
Scientific organizations	
Commonwealth Scientific and Industrial Research Organisation (CSIRO) Atmospheric Research, Australia	One model and one tool. General tool for a risk management framework for climate change impact and adaptation assessment; and model for the coastal sector.
Pacific Northwest National Laboratory, USA	General tool to assess adaptation potential and vulnerab
Environmental Change Institute, University of Oxford, UK	Four methods and tools to assess adaptation strategies , with application example for two sectors in Africa.
Judge Institute of Management Studies, University of Cambridge, UK	Model to evaluate adaptation policy choices across all sectors.
Potsdam Institute for Climate Impact Research, Germany	Model to evaluate the long-term climate change policy paths.
University of Guelph, Canada	Three tools to assess impacts and evaluate adaptation responses in agriculture and two tools applicable to mul sectors.
Wesleyan University, USA	Conceptual tool to access adaptive capacity.
Non-governmental environmental organizations	
Bread for the World	A concept for development of a compendium of useful agricultural practices that have proved to combat drough waterlogging problems, which could be used for adapta to climate change in agriculture.
Other	
Group of experts involved in the UNDP programme on vulnerability index development	Comments on the use of the methods and tools currentl the database. Comments on possible further of the data and on the UNFCCC work on impacts and adaptation methodologies.
Group of IPCC lead authors	Comments on the use of the methods and tools currentl the database. Comments on possible further of the data and on the UNFCCC work on impacts and adaptation methodologies.

Annex II

METHODS, MODELS AND TOOLS AND BRIEF DESCRIPTION OF THEIR APPLICATION BY SECTOR[1]

Model, method or tool	Brief description
Methods or tools applicable to multiple sectors	
Agent-Based Social Simulation	A computer programming method to conduct stakeholder and institutional analysis; approach to modelling that seeks to formalize stakeholder rules.
Stakeholder Networks and Institutions Analysis for the Evaluation of Adaptation Strategies	Analytical method for analysis of different stakeholders and institutions in the context of future climate change related risks.
Climatic Change and Variability (CCAV)	A framework for assessment of climate change and variability in the context of the coping capacity of human systems.
Judging Adaptive Capacity	A conceptual framework to initially evaluate planned adaptation in the context of a wide range of plausible scenarios.
Dimensions of Adaptation Model (DAM)	A method representing the major dimensions of adaptation to set a framework for adaptation research.
Regional Climate Model over China (GCM/CN)	A regional numerical climate model to predict climate change, particularly changes in extreme events and climate anomalies, over a regional domain.
Guidelines for the Evaluation of Adaptation Strategies in Agriculture and Water Sector in Africa	A checklist of the factors that form part of a broad evaluation of measures and strategies.
Climate Scenarios/Prediction System	A modelling system to predict regional climate change due to both natural and man-made factors.
Risk Management Framework	Methodology for an environmental risk assessment and management framework for climate change impact and adaptation assessments.
Policy Analysis of the Greenhouse Effect (PAGE)	A computer model for integrated assessment which treats adaptation as a policy choice to be evaluated on the same basis as mitigation.
Tolerable Windows Approach (TWA)	A computer model that applies the principles of the safe minimum standard approach to long-term environmental problems, in particular to the climate change problem, to assess different policy paths.

[1] Only information submitted in accordance with the submission form provided on the secretariat web site is summarized in the table.

Vulnerability Indices	A formal means of assigning priority for the evalua of adaptation strategies.
Vulnerability Indicators Programme (VIP)	A quantitative method to assess the vulnerability of valued attributes of societies and economies.
Water sector	
Flood and Drought Risk Analysis System	A package of mathematical models designed to estimate the time-varying changes in the frequency flood and drought and their socio-economic consequences across all sectors.
Runoff Evaluation System	A software package to assess changes in runoff and water resources and response measures.
Coastal sector	
Predicting Model for Sea Level Change Along the Chinese Coasts	Calculating method to assess the submergible area to sea-level rise.
Storm Surge Heights under Conditions of Climate Change and Sea Level Rise	A quantitative method to evaluate the impact of sea-level rise and storm surges on the coastal area.
Agricultural sector	
Government Support for Agriculture Losses due to Climatic Variability	A quantitative statistical method to evaluate the government supports for extreme weather and clim variability in agriculture over time.
Agricultural Adaptation to Climatic Variation	Computer and numerical model to assess different forces that influence adaptation responses, and to classify those responses into decisions at the farm regional levels.
Chinese Weather Generator (CWG)	A computer program for generating long-series dai weather data to define model parameters for the cr models.
Productivity Function Model	A statistical model to simulate and assess both the effects of changes in natural factors and the effec the different agricultural management measures.
Relative Risk Index (RRI)	A quantitative method to illustrate the relative risk positions of individuals before or after adaptation.

Natural ecosystems	
Historical Disaster Analogue (HDA)	A qualitative tool to assess climate change impacts on ecosystems using historical records of extreme events as analogue of possible future conditions
Climate Vegetation Response Model	A simulating model to evaluate the potential impact of climate change on vegetation types, distribution, area and biomass.
Forestry sector	
Process Forest Model: Geographical Information System for the Impact of Climate Change on Forest	A geographic information system (GIS) based model to assess the changes in forest and different management options.